

CLAIMS

1. A musical instrument sound detection system comprising:  
a fibre optic acoustic sensor;  
a source of electromagnetic radiation optically coupled to said fibre optic acoustic  
5 sensor and operable to input electromagnetic radiation to said fibre optic acoustic  
sensor; and  
an electromagnetic radiation detector arranged to receive electromagnetic radiation  
output from said fibre optic acoustic sensor and operable to detect at least one  
property of said output electromagnetic radiation; wherein  
10 said fibre optic acoustic sensor is responsive to sound generated by a musical  
instrument and is operable to vary said at least one property of said input  
electromagnetic radiation in response to that sound in order to generate the output  
electromagnetic radiation, said electromagnetic radiation detector being operable to  
detect variations in said at least one property of said output electromagnetic radiation  
15 indicative of this sound generated by the musical instrument and to produce output  
signals in response thereto.
2. A musical instrument sound detection system according to claim 1, wherein  
said fibre optic acoustic sensor comprises a fibre laser acoustic sensor, comprising an  
20 optical fibre doped to provide a doped lasing volume, said fibre having two gratings  
provided in said doped volume, said fibre laser acoustic sensor being operable to vary  
a wavelength of said input electromagnetic radiation in response to the sound from the  
musical instrument, and said electromagnetic radiation detector being operable to  
detect variations in wavelength of said output electromagnetic radiation.  
25
3. A musical instrument sound detection system according to claim 2, wherein  
said optical fibre is coated with polyurethane.
4. A musical instrument sound detection system according to claim 1, wherein  
30 said fibre optic acoustic sensor comprises an interferometric detector, comprising an  
optical fibre, a portion of said optical fibre being coiled around a compliant core, said

sensor further comprising reflectors in optical communication with said optical fibre before and after said coil, such that a portion of said electromagnetic radiation is reflected before entering said coil by a first of said reflectors and a further portion of said electromagnetic radiation is reflected after passing through said coil by a second of said reflectors, said electromagnetic radiation detector being operable to detect variations in phase between said output electromagnetic radiation reflected by each of said reflectors.

5. A musical instrument sound detection system according to any of the preceding claims, wherein said fibre optic acoustic sensor comprises attachment means for attachment to a musical instrument.

6. A musical instrument sound detection system according to any preceding claim, wherein said musical instrument is a stringed musical instrument.

7. A musical instrument sound detection system according to claim 5 and 6, wherein said attachment means are for attachment across the sound hole, to the bridge, body, acoustic chamber or the soundboard of said stringed musical instrument.

8. A musical instrument sound detection system according to any preceding claim, said system further comprising a plurality of fibre optic acoustic sensors, said plurality of fibre optic sensors being arranged in series such that electromagnetic radiation from said source passes through each of said sensors in turn.

9. A musical instrument sound detection system according to claim 8, wherein said plurality of fibre optic acoustic sensors are arranged in series along an optical fibre, the distance between respective sensors being such that individual fibre optic sensors may be arranged on different musical instruments with optical fibre connecting said plurality of sensors.

10. A musical instrument sound detection system according to any preceding claim, said musical instrument sound detection system further comprising a signal

processor operable to process said output signals received from said electromagnetic radiation detector and to produce acoustic signals that are compatible with a conventional amplifier and/or sound recording system therefrom.

- 5 11. A musical instrument having a musical instrument sound detection system according to any one of claims 1 to 8 or 10 attached thereto, wherein said fibre optic acoustic sensor or sensors are arranged to receive sound generated by said musical instrument.
- 10 12. A musical instrument according to claim 11, wherein said musical instrument is a solid bodied guitar.
13. A method of detecting sound from at least one musical instrument comprising the steps of:
- 15 (i) arranging a fibre optic acoustic sensor to receive sound generated by a musical instrument;
- (ii) inputting electromagnetic radiation into said fibre optic acoustic sensor, said fibre optic acoustic sensor being operable to vary at least one property of said input electromagnetic radiation in response to that sound in order to generate output
- 20 electromagnetic radiation;
- (iii) detecting variations in said at least one property of said output electromagnetic indicative of the sound generated by the musical instrument and producing output signals in response thereto.
- 25 14. A method of detecting sound from at least one musical instrument according to claim 13 wherein said fibre optic acoustic sensor comprises a fibre laser acoustic sensor, and step (iii) of said method comprises detecting variations in wavelength of said output electromagnetic radiation.
- 30 15. A method of detecting sound from at least one musical instrument according to claim 13 wherein said fibre optic acoustic sensor comprises an inteferometric detector,

and step (iii) of said method comprising detecting variations in said phase of said output electromagnetic radiation.

16. A method of detecting sound from at least one musical instrument according to  
5 any one of claims 13 to 15, wherein step (i) of said method comprises attaching said fibre optic acoustic sensor to said at least one musical instrument.

17. A method of detecting sound from at least one musical instrument according to  
10 any one of claims 13 to 16, wherein said musical instrument is a stringed musical instrument.

18. A method of detecting sound from at least one musical instrument according to  
claim 17 when dependent on claim 16, wherein said fibre optic acoustic sensor is  
15 attached to the bridge of said stringed instrument.

19. A method of detecting sound from at least one musical instrument according to  
claim 17 when dependent on claim 16, wherein said fibre optic acoustic sensor is  
attached to the soundboard or body of said stringed instrument.

20. A method of detecting sound from at least one musical instrument according to  
20 claim 17 when dependent on claim 16, wherein said fibre optic acoustic sensor is attached between the sound board and the bridge of said stringed instrument.

21. A method of detecting sound from at least one musical instrument according to  
25 any one of claims 13 to 20, wherein step (i) of said method comprises arranging a plurality of said fibre optic sensors to receive sound generated by a musical instrument.

22. A method of detecting sound from a plurality of musical instruments according  
30 to claim 21, wherein said plurality of fibre optic sensors are arranged on a plurality of musical instruments.

23. A method of detecting sound from a plurality of musical instruments according to any one of claims 13 to 22, said method further comprising the step of:

(iv) processing said output signals to produce acoustic signals that are compatible with a conventional amplifier and/or sound recording system.

5

24. The use of a fibre optic acoustic sensor within a musical instrument sound detection system according to any one of claims 1 to 10 to detect the sound generated by at least one musical instrument.

10 25. A musical instrument sound detection system substantially as hereinbefore described with reference to any one of Figures 2 to 4.

26. A musical instrument having a musical instrument sound detection system substantially as hereinbefore described with reference to any one of Figures 2 to 4.

15

27. A method of detecting sound from at least one musical instrument substantially as hereinbefore described with reference to any one of Figures 2 to 4.

20 28. The use of a fibre optic acoustic sensor within a musical instrument sound detection system substantially as hereinbefore described with reference to any one of Figures 2 to 4.